Introduction

Utopia Come True?

Are we living in Utopia? This may seem a strange question – our television news with its footage of disaster does not immediately suggest we do – but today's world is much more similar to our ancestors' utopian dreams than most people realize. 'Utopia' – a newly invented word meaning 'nowhere' – was the title of a book by Thomas More (1478–1535), published in 1516. It describes an imaginary and perfectly organized kingdom, located just off the coast of America. A few decades before, the 'New World' had been discovered, and this had sparked the idea that an ideal society did not have to await the hereafter, but could be created here and now.

The perfect organisation of Utopia guarantees its citizens complete happiness. Private property and the privileges of the nobility have been abolished, everybody works only 6 hours a day, and the head of state is chosen in free, representative elections. In More's Utopia, people live in spacious and ventilated houses, and the government inspects their food and supplies them with clean drinking water. A system of social security prevents those who fall ill from becoming poor, and those who are poor from falling ill – and people who despite all countermeasures still fall ill, have the right to be treated in excellent public hospitals. No wonder that, as More notes, "[not] anywhere are there healthier men and freer from diseases."¹

Although the term 'utopia' has become synonymous for unattainable ideals of perfect societies, it is remarkable how much of More's utopian health vision has been realized in the 20th century, and mostly without the draconic reorganization of society that More thought necessary. Through the centuries, utopian visions have served as a source of inspiration for those who believed that a better world could be created, in which nobody would suffer from avoidable or remediable ill-health. This is even more clear in the case of a number of 19th

1 Thomas More, *De Optimo Rei Publicae Statu Deque Nova Insula Utopia* [On the Best State of a Republic and on the New Island Utopia] (Leuven, 1516). The sentence in the text was cited from the Open|Utopia edition, edited by Stephen Duncombe, p. 135 (www.theopenutopia.org, accessed 25/08/2019). For commentaries on the health aspects of More's Utopia, see Phil Withington, "Utopia, Health, and Happiness," *Lancet* 387, no. 10033 (2016): 2084–085; Johan P. Mackenbach, "Thomas More, Etienne Cabet and the Paradoxes of Utopian Thinking," *European Journal of Public Health* 14, no. 2 (2004): 113.

century Utopias. The novel *Voyage et Aventures de Lord William Carisdall en Icarie* by Étienne Cabet (1788–1856) is a good example. This book, published in 1840, describes a communist utopia in which prevention of illness had a high priority (Plate 1).

The following quote gives an idea of Cabet's utopian dream:

Within the city there are no cemeteries, no noxious products manufactured, no hospitals: all these establishments are on the outskirts, in open places, near swift-flowing streams or in the country. [...] You would see here neither cabarets, nor roadhouses, nor cafés, nor smoking joints, nor the stock-exchange [...] just as there are no prostitutes or pickpockets, no drunkards or mendicants; but instead you would find everywhere PRIVIES, as elegant as they are clean and convenient, some for women, others for men [...].²

Cabet's work attracted considerable support, and in 1848 a group of 1500 followers set off from France to America to establish a colony on the model of *Icarie*. However, practice proved to be more difficult than theory: the group split, and Cabet himself died in St. Louis shortly thereafter. Nevertheless, many 19th century readers must have felt attracted by the prospect of living in a cleaner, safer, more equitable, and healthier city. And it only required social justice and good government!³

Rising Life Expectancy

Over the past three centuries, health of Europeans has improved enormously. This can most clearly be seen in the spectacular increase in the length of life (Figure 1). Around the middle of the 19th century, life expectancy at birth fluctuated around an average of less than 40 years, but in the last decades of that century life expectancy began to rise rapidly, to reach the current values of between 65 and 80 years among men, and between 75 and 85 years

2 The original publication is Étienne Cabet, *Voyage et Aventures de Lord William Carisdall en Icarie* (Paris: H. Souverain, 1840). The quote is cited from an extract at <http://urbanplanning.library.cornell.edu/DOCS/cabet.htm> (accessed 20/08/19).

3 Some philosophers have argued that striving for utopia inevitably leads to totalitarianism, because the realization of utopian societies is incompatible with human freedom (e.g., Melvin J. Lasky, *Utopia and Revolution* (Chicago: University of Chicago Press, 1976)). More's Utopia is indeed far from a liberal society, and even needs slavery for its functioning. Also, seriously ill, but incurable patients are persuaded to commit suicide or have themselves euthanized. See Chapter 7 for the Soviet Union as a 'realized utopia', and Chapter 8 for the need to 're-think Utopia'.

PLATE 1 Cabet's utopian principles. Title page of *Voyage en Icarie*, 1848
Title page of the 5th edition of Cabet's *Voyage en Icarie*, published in 1848. It lists a number of principles summing up Cabet's philosophy, such as *Fraternité* [Brotherhood], *Tous pour chacun – Chacun pour tous* [All for everyone – everyone for all], *Premier droit, Vivre – Premier devoir, Travailler* [First right, to Live – First duty, to Work], and *Bonheur commun* [Common happiness]. After settling his utopian community in Nauvoo (Illinois), Cabet announced that the common dining room would be decorated with wall inscriptions listing the principles of the community. These ranged from the abolition of private property to the duty to work, and from the duty of mutual assistance to the prohibition of tobacco.
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FIGURE 1 Trends in life expectancy in Europe, 1730–2015

Notes: For women, see Suppl. Figure 1

SOURCE OF DATA: SEE SUPPL. TABLE 1

among women. It is difficult to think of a more important change in the whole of human history – unimaginable even for the most utopian among our predecessors.

This increase in the length of life has been accompanied by enormous changes in people's health. Many diseases have disappeared, and while other diseases have taken their place, these occur at higher ages than the diseases of the past, so that most health problems now occur among older people. And because the greatest advances have been made by preventing diseases from occurring, not only has the total number of life-years increased, but so has the number of years that Europeans can expect to live in good health.

It is only more recently that the number of years that we can expect to live in *ill*-health has also increased. Since the middle of the 20th century, medical treatment of chronic conditions has made an increasing contribution to

improvements in life expectancy. As a result of increased survival of patients with chronic diseases, total life expectancy has increased faster than 'healthy life expectancy', and years of life spent with disease have increased rather strongly.

Although the improvements in population health have been spectacular everywhere, European countries have followed very different trajectories. Health improvements have occurred at different times and with different speeds, resulting in the very broad band of upward moving life expectancies that can be seen in Figure 1. The width of this band has been indicated by the highlighted curve for Sweden, which for a long time had the highest life expectancy, and the curve for Turkey, which until recently was the country with the lowest life expectancy.

The gap in life expectancy between Sweden and Turkey increased from around 10 years in the beginning of the 19th century to around 25 years in the 1930s, and then narrowed again to around 8 years in the beginning of the 21st century. More generally, for most of the time Northern and Western Europe have taken the lead, later joined by Southern Europe, and with most parts of South-eastern and Eastern Europe consistently staying behind.⁴

Using a unique collection of historical data and recent research findings, this book shows that these trends and variations did not arise spontaneously, but were mostly man-made. This does not only apply to health improvements – which often resulted from increases in the human capacity to address the causes or consequences of disease – but also to temporary setbacks. Throughout European history, health and longevity were therefore closely related to economic, political and sociocultural conditions.

The Rise and Fall of Disease

Talking about setbacks: the rise of life expectancy has not been a smooth process, as can be clearly seen in Figure 1. Some of the dips in the life expectancy curves were very deep indeed – the deepest dip occurred during the 1933 famine in Ukraine when average life expectancy at birth briefly declined to below 10 years. Below the surface of rising life expectancy and declining total mortality the trends are even more irregular. Specific causes of death have risen and

4 For more detailed studies of convergence and divergence of life expectancy between European countries, see Johan P. Mackenbach, "Convergence and Divergence of Life Expectancy in Europe: A Centennial View," *European Journal of Epidemiology* 28, no. 3 (2013): 229–40; David A. Leon, "Trends in European Life Expectancy: A Salutory View," *International Journal of Epidemiology* 40, no. 2 (2011): 271–77.

fallen over time, and it is only because 'falls' ultimately had the upper hand that life expectancy could rise.

This is one of the main findings of this book, which reviews the history of around 40 health conditions. These range from famine and plague to motor vehicle injuries and suicide, and from maternal mortality and cholera to diabetes and cerebrovascular disease. Seen in a long-term perspective the trends for these health conditions often follow a striking pattern of 'rise-and-fall'. Most diseases which were common at their peak, were uncommon centuries or decades before, and their rise was usually followed by an equally impressive decline.

Although each disease has its own specific causes, we will see that the general explanation for rises of disease is that human efforts to improve their living conditions often required or allowed them to undertake new activities, which later turned out to be health-damaging. Just like long-distance trade brought the plague from Central Asia into Europe, so did education and reading increase the risk of myopia, and just like urban living increased the likelihood of tuberculosis infection, so did an affluent diet increase the risk of ischaemic heart disease.

Similarly, declines of disease had many specific explanations, but when one takes a bird's eye view it becomes crystal-clear that it is highly unlikely that most declines occurred spontaneously. The general explanation is that the drive for better living conditions not only brought new health risks, but also created the necessary conditions for reducing these risks. For example, prosperity brought better nutrition and better housing, and economic growth made it possible for countries to invest in science and technology, safe drinking water, vaccinations, cholesterol-lowering drugs, and road traffic safety measures.

Nevertheless, it would be too simple to see economic development as the only, or even the main, driver of changes in population health. The history of Europe is full of examples where economic development and population health did not move in parallel. This shows that economic growth was usually not a sufficient condition for health improvement. For example, at various points in time Sweden, the Netherlands and Albania were over-performers in health as compared to their level of economic development, whereas Portugal and Russia were under-performers.

Closer inspection of these and other examples reveals that acceptance of measures to reduce health risks also often required sociocultural change, and that effective implementation required institutions able to deliver them on a large scale, such as an effective public health sector and an accessible health care system. Throughout European history, creating these conditions was a

profoundly political enterprise. This is illustrated by the fact that national boundaries and political events, such as revolutions and dissolutions of empire, often coincided with sharp break-lines in population health.

These are the issues that this book is about. Using a wide range of quantitative data, from life expectancy to infectious disease notification rates, and from lung cancer mortality to average heights of recruits, we will look through the ‘telescope of history’ to discern some of the deeper causes of the rise of life expectancy since the 18th century. The results will be used to reflect on contemporary theories of determinants of population health, and the first of these is the theory of the ‘epidemiologic transition’. Because this has proven such a powerful organizing concept we briefly introduce this theory up-front in this introductory chapter.

The Epidemiologic Transition Theory

The ‘epidemiologic transition theory’ was originally proposed in a paper by Egyptian-American epidemiologist Abdel Omran (1925–1999). This paper, published in 1971, has since become a ‘citation classic’, with more than 4000 citations in later scientific publications. The epidemiologic transition describes the mortality component of the ‘demographic transition’: the long-term decline of (first) mortality and (then) fertility that accompanied socioeconomic modernization around the world.⁵

Omran characterized the epidemiologic transition as a “long-term shift [...] in mortality and disease patterns whereby pandemics of infection are gradually displaced by degenerative and man-made diseases as the chief form of morbidity and primary cause of death.” This shift occurs in three stages: the “age of pestilence and famine” in which life expectancy “vacillat[es] between 20 and 40 years” and “mortality [is] high and fluctuating”; the “age of receding

5 The ‘demographic transition’ theory was introduced around the middle of the 20th century. Its intellectual history has been traced in Dudley Kirk, “Demographic Transition Theory,” *Population Studies* 50, no. 3 (1996): 361–87; Jean-Claude Chesnais, *La Transition Démographique* (Paris: Presses Universitaires de France, 1986). More critical assessments can be found in Dennis Hodgson, “Demography as Social Science and Policy Science,” *Population and Development Review* 9, no. 1 (1983): 1–34; Simon Szreter, “The Idea of Demographic Transition and the Study of Fertility Change,” *Population and Development Review* 19, no. 4 (1993): 659–701. Like Omran and others, and despite its ambiguity, we will sometimes use the term ‘modernization’ in this book, usually accompanied by the adjective ‘socioeconomic’. For an interesting commentary on this somewhat dubious term, see AHR Roundtable, “Historians and the Question of ‘Modernity,’” *American Historical Review* 116, no. 3 (2011): 631–751.

pandemics” in which life expectancy “increases steadily from about 30 to about 50 years” and “epidemic peaks become less frequent or disappear”; and the “age of degenerative and man-made diseases” in which life expectancy “rises gradually until it exceeds 50 years” and mortality “eventually approaches stability at a relatively low level.”⁶

In his 1971 paper Omran did not define ‘degenerative and man-made diseases’, but in a later update he mentioned cardiovascular disease, cancer, stroke, diabetes, and metabolic disorders as examples of ‘degenerative diseases’. “Radiation injury, accidents, occupational hazards, carcinogens in the environment and in industry, and food additives” are examples of “diseases introduced by man.”

Omran recognized that in Western Europe and North America the shift started early and took approximately 100 years. This is the ‘western’ or ‘classical’ model of the epidemiologic transition. In a number of other countries, notably Eastern Europe and Japan, the transition started later but proceeded much more quickly (the ‘accelerated’ model). He considered rising living standards to be an important driver of population health change in the western model, and public health and medical technologies to be relatively more important in the accelerated model.⁷

Although the notion of an ‘epidemiologic transition’ has stuck in the demographic and epidemiologic literatures, it has since become clear that Omran’s picture of these long-term changes in population health is less than accurate, both conceptually and factually. The characterization of the shift as one from ‘pandemics’ of infectious diseases to ‘degenerative and man-made diseases’ is imprecise, as is the distinction between the three ‘stages’. Furthermore, just when Omran published his theory a renewed decline of mortality contradicted his idea that the transition had ended in new stability.

These and other problems have shown that Omran’s theory is in need of repair, but a satisfactory replacement has not yet been agreed on. Can the

6 Abdel R. Omran, “The Epidemiologic Transition: A Theory of the Epidemiology of Population Change,” *Milbank Memorial Fund Quarterly* 49 (1971): 509–38; the citations are from pages 518–20. The original paper was republished twice: in 2001 in the *Bulletin of the World Health Organization*, and in 2005 in the *Milbank Quarterly*. For the history of this ‘citation classic,’ see George Weisz and Jesse Olszynko-Gryn, “The Theory of Epidemiologic Transition: The Origins of a Citation Classic,” *Journal of the History of Medicine and Allied Sciences* 65, no. 3 (2009): 287–326.

7 Omran revisited his original ideas several times, without making substantial changes. See Abdel R. Omran, “The Epidemiologic Transition Theory. A Preliminary Update,” *Journal of Tropical Pediatrics* 29 (1983): 305–16; Abdel R. Omran, “The Epidemiologic Transition Theory Revisited Thirty Years Later,” *World Health Statistics Quarterly* 51, no. 2–4 (1998): 99–119.

stages simply be relabelled or is a more fundamental revision in order? Can more recent changes simply be accommodated by adding a fourth stage, as some authors have proposed, or should these be seen as the start of an entirely new transition?

The McKeown Debate and the Preston-Curve

There can be little doubt that the modern rise of life expectancy is related to improved living standards. It cannot be a coincidence that both life expectancy and national income showed steep rises over the 19th and 20th centuries – but how exactly are the two related? Two scientific studies, both published in the 1970s, still form the anchor-points of present-day discussions of this question.

The first is a series of publications by British professor of social medicine Thomas McKeown (1912–1988). McKeown made a detailed analysis of the history of cause-specific mortality in England and Wales since the 1840s, and summarized his conclusions in *The Role of Medicine – Dream, Mirage or Nemesis* (1976). His analyses showed that the decline in mortality was the result mainly of a decline of infectious diseases, and that infectious disease mortality decline for the most part antedated the introduction of specific medical interventions, such as vaccinations and antibiotics. In other words: the role of medicine can only have been marginal.

McKeown also showed that most of the decline of mortality from infectious diseases in England and Wales was due to a decline of air-borne diseases, particularly respiratory tuberculosis, and not to the water-borne diseases to which most public health interventions were targeted. He therefore concluded that neither medical care nor public health interventions could account for the decline in mortality. This must therefore have had another explanation – which he thought was improved nutrition, due to improvements in agricultural productivity and food transportation.⁸

8 McKeown published his findings first in a series of papers: Thomas McKeown and Robert G. Brown, "Medical Evidence Related to English Population Changes in the Eighteenth Century," *Population Studies* 9, no. 2 (1955): 119–41; Thomas McKeown and Robert G. Record, "Reasons for the Decline of Mortality in England and Wales During the Nineteenth Century," *Population Studies* 16, no. 2 (1962): 94–122; Thomas McKeown, Robert G. Record, and R.D. Turner, "An Interpretation of the Decline of Mortality in England and Wales During the Twentieth Century," *Population Studies* 29, no. 3 (1975): 391–422. These were followed by two books, both published in 1976: Thomas McKeown, *The Role of Medicine: Dream, Mirage, or Nemesis?* (London: Nuffield Provincial Hospitals Trust, 1976); Thomas McKeown, *The Modern Rise of Population* (London: Edward Arnold, 1976). The title of the first book reminds us of Ivan Illich (1926–2002), who argued that iatrogenic side-effects posed "limits to medicine" (Ivan Illich, *Medical Nemesis: The Expropriation of Health* (London: Calder & Boyars, 1975)).

Although his viewpoint that the rise of life expectancy is just a by-product of socioeconomic progress, and not of human intervention, is still commonly held, McKeown's conclusions must be considered at least partly obsolete in the light of more recent findings. We will have a look at the results of more recent studies in various chapters of this book, and argue that public health and medical care have had a more important role than McKeown thought.⁹

Another influential paper, published in 1975 by American demographer Samuel Preston, also dealt with the explanation of the rise of life expectancy, but came to rather different conclusions on the role of rising living standards. This paper is mainly famous for the introduction of the so-called 'Preston-curve', which relates national income to average life expectancy at birth. It shows that people living in richer countries on average live longer than people in poorer countries, and that although the relation is steeper at lower levels of income, it holds at higher levels as well.¹⁰

However, an equally important finding in this paper was that when Preston compared these curves for different points in time (i.e. the 1900s, 1930s and 1960s), he found that the curve had shifted upwards from the 1900s to the 1930s, and again from the 1930s to the 1960s. At any given level of national income (adjusted for inflation), life expectancy was higher in the 1930s than in the 1900s, and in the 1960s than in the 1930s. Furthermore, the upward shift in the curve explained more of the global rise in life expectancy between these points in time than rising national incomes.¹¹

Preston interpreted this as indicating that other factors than income growth, such as public health programs, maternal and child health services, and

9 The literature about the 'McKeown thesis' is massive. One of the most influential critiques of McKeown's dismissal of public health was written by British historian Simon Szreter; see Simon Szreter, "The Importance of Social Intervention in Britain's Mortality Decline c. 1850–1914," *Social History of Medicine* 1, no. 1 (1988): 1–37. For a critique on McKeown's dismissal of medical care, see Johan P. Mackenbach, "The Contribution of Medical Care to Mortality Decline: McKeown Revisited," *Journal of Clinical Epidemiology* 49, no. 11 (1996): 1207–213. In 2005, the *International Journal of Epidemiology* published a series of commentaries on the 'McKeown debate', one of which concluded that it was "time for burial": Emily Grundy, "Commentary: The McKeown Debate: Time for Burial," *International Journal of Epidemiology* 34, no. 3 (2004): 529–33.

10 An example of a 'Preston-curve' will be presented in Chapter 3 (Figure 6).

11 Samuel H. Preston, "The Changing Relation between Mortality and Level of Economic Development," *Population Studies* 29, no. 2 (1975): 231–48. The importance of Preston's paper is illustrated by the fact that, like Omran's 1971 paper, it has twice been reprinted as a 'classic': first in the *Bulletin of the World Health Organization* (2003) and then in the *International Journal of Epidemiology* (2007).

antibiotics probably accounted for a sizable part of the rise in life expectancy between the 1930s and 1960s. Although these interventions were mostly developed in richer countries, health breakthroughs spread rapidly to poorer countries. This allowed them to reach high levels of life expectancy at lower levels of income than the richer countries before them.

It is important to note that Preston's conclusion is, like McKeown's, by exclusion. Rising income can explain only a small part of the rise in life expectancy, so there must be something else, i.e. public health and medical care. Direct evidence for the impact of public health and medical care is not given. Nevertheless, Preston's findings warn against simple economic determinism. This will also be the conclusion of a review of more recent studies in Chapter 3 of this book.

The Role of Human Agency

The big question underlying this 'battle of ideas' is: what has been the role of 'human agency' in achieving long-term improvements in population health? Have these improvements been a by-product of other developments which happened spontaneously? Or have population health improvements been the result of actions explicitly intended to improve health outcomes?¹²

As this book will demonstrate, most long-term health improvements did not arise spontaneously, but were in one way or another man-made. This is already strongly suggested by the 'rise-and-fall' pattern that can be seen for so many diseases. It is highly unlikely that all the declines of disease that have occurred over the past three centuries happened spontaneously. Nevertheless, in order to demonstrate a role of 'human agency' it will be necessary to look at the evidence in a lot more detail: disease-by-disease, and factor-by-factor.

It will also be important to clarify what we actually mean by 'spontaneous', which is a deceptively simple term. Classifying the developments that underlie long-term improvements in population health into 'spontaneous' and 'intentional' is not trivial. What some further reflection reveals is that this distinction is not black-and-white. There is black, then there are various shades of grey, and then there is pure white. Here is a possible classification:

- 1) Changes in human health as a result of changes in living conditions which happen without any human involvement. Examples include

¹² The term 'human agency' – a term that has very specific meanings in, e.g., philosophy and sociology – will be used throughout this book to loosely refer to 'humans acting intentionally'. We will not assume that these acts always arise out of free will, or are always based on consciously made decisions. 'Human agency' occurs at many levels, from single individuals to international organizations.

- changes in climate as occurred at the end of the 'Little Ice Age', or changes in the virulence of micro-organisms.
- 2) Changes in human health as a result of changes in human behaviour or of man-made changes in living conditions, which are actively pursued but for reasons completely unrelated to health. Examples would be changes in behaviour pursued for 'social distinction', or shifts from an industrial to a service economy which coincidentally reduced exposure to hazardous working conditions.
 - 3) Changes in human health as a result of changes in human behaviour or of man-made changes in living conditions, which are pursued for reasons indirectly related to health. Examples would include changes in behaviour pursued for reasons of cleanliness, or changes in agricultural methods aimed at increasing harvest yields. Both cleanliness and large harvest yields are important in themselves, but also have indirect health benefits.
 - 4) Changes in human health as a result of public health interventions. These are changes in human behaviour or living conditions, which are pursued for reasons directly related to health, but involve actions outside medical care. Examples are changes in smoking in response to health education campaigns, or changes in injury risk as a result of road traffic safety measures.
 - 5) Changes in human health as a result of medical care. These are, like the previous category, by definition pursued for reasons directly related to health, but involve actions in an individual contact between a health care professional and a patient seeking care. Examples are changes in pneumonia mortality as a result of the introduction of antibiotics, and changes in survival rates from cancer due to improvements in cancer treatment.

Of these, only the changes under (1) are completely 'spontaneous', and only those under (4) and (5) are definitely 'intentional', but (2) and (3) are somewhere in-between. Nevertheless, even the population health improvements resulting from (2) and (3) should be considered 'man-made'. The multifaceted nature of all these 'man-made' changes also explains why population health is so closely related to economic, political and sociocultural conditions: these conditions do not only determine (4) and (5), but also (2) and (3).¹³

13 The scale of 'intentionality' is, of course, more continuous than these five 'positions' suggest. For example, changes in human health as a result of changes in individual behaviour, if informed by knowledge of the health effects of this behaviour, lie somewhere

How to Read This Book

This book consists of three main parts: a general overview of long-term trends in population health; a second part zooming into the detailed history of around 40 specific health conditions; and a final part in which the disease-specific story-lines are woven together again to reach some general conclusions.

In the first part we take the increase in life expectancy as our starting-point. We follow its trail back by looking at the underlying shifts in disease patterns, to discover a fascinating sequence of 'rises-and-falls' of almost all health conditions whose long-term course we can follow through time. After an attempt to revise Omran's epidemiologic transition theory, we then consider possible explanations of these changes. Starting from an understanding of disease as mostly originating from the interaction between human organisms and their environment, we review the evidence on what actually caused long-term changes in population health. These mostly did not occur spontaneously, but were driven by various forms of 'human agency'. This is reflected in strong parallels between population health change and changes in economic, political and sociocultural conditions, and in identifiable impacts of public health and medical care.

In the second part we zoom in to look at the history of a wide range of diseases and other health problems. Although it is impossible to cover everything, the many health conditions covered in Part 2 ensure that we get a good overview of the diversity of factors that have played a role in the 'rise-and-fall' of disease. This book brings together a collection of data which sometimes go back as far as the early 18th century, and often reach into the second decade of the 21st century. These are presented in a series of graphs that – even for those familiar with the history of medicine and public health – hold many surprises. These data are combined with a review of what we know about the explanation of these long-term trends, to explore in detail what their immediate and ultimate causes were.

In the third part we return to the broader perspective of the first part, and synthesize our findings into a few general conclusions on the role of 'human agency' in long-term improvements in population health. We review the historical experience of a few carefully selected countries from around Europe, in an attempt to create a coherent story of how economic, political and sociocultural change and the rise of public health and medical care shaped these countries' health trajectories. These lessons from the past are then finally used to

in-between (3) and (4), and advocacy for sanitation and other public health measures by 19th century medical doctors lies somewhere in-between (4) and (5).

reflect upon the challenges of the future, and to discuss the sustainability of current levels of population health.

All in all, this will be a story of tremendous progress. Who can deny the value of a longer life, and the benefits of living many more years in good health? Yet, this story also has darker sides to which we cannot close our eyes. One 'inconvenient truth' is that some of the fastest advances occurred under conditions of political oppression, suggesting that the politics underpinning population health improvement are not always innocent. The same applies to the economic underpinnings: economic growth was partly dependent on the exploitation of Europe's colonies in other parts of the world, and on the massive burning of fossil fuels which is now changing the world's climate. Furthermore, human population numbers have soared and as a result other living species have suffered. These darker sides will have to be acknowledged, if only because some of them are linked to the challenges of the future.

This book is different from many others. Let me briefly mention a few other books of medical history, to clarify what this book is and what it is not. First of all, this is not a history of 'public health', but of 'people's health'. George Rosen's *A History of Public Health* (1958) is the most widely known history of the field of 'public health'. This is still a good general introduction to the development of the knowledge base, institutions and professions in this field. More recent is Dorothy Porter's *The history of Public Health and the Modern State* (1994). This is one of the very few books explicitly focusing on the development of public health in different European countries, but like Rosen's book has very little on the actual development of the object of public health: population health.¹⁴

Important, but more encyclopaedic than story-telling, is the *Cambridge World History of Human Disease* (1993), which has histories of no less than 158 specific health conditions. Examples of more compact histories of disease, which are now outdated but can still be informative as a general introduction, are Erwin Ackerknecht's *History and Geography of the Most Important Diseases* (1965) and Folke Henschen's *The History of Diseases* (1966). Closer to this book comes Mark Harrison's *Disease and the Modern World – 1500 to the Present Day*

14 Rosen's *A History of Public Health* was originally published in 1958 (George Rosen, *A History of Public Health* (Baltimore: Johns Hopkins University Press, 1958 [expanded edition 1993])). In addition to the book mentioned in the text (Dorothy Porter, *The History of Public Health and the Modern State* (Amsterdam: Editions Rodopi, 1994)), Dorothy Porter has published several other important books on the history of public health: Dorothy Porter, *Health Citizenship* (Berkeley etc.: University Of California Medical Humanities Press, 2011); Dorothy Porter, *Health, Civilization and the State* (London and New York: Routledge, 2005). A compact and recent history of public health is Virginia Berridge, *Public Health: A Very Short Introduction* (Oxford etc.: Oxford University Press, 2016).

(2004). This is a synthetic history of diseases, chronologically presented, and placed in their socioeconomic and political context, but with a strong emphasis on communicable diseases and no quantitative data.¹⁵

The quantitative character of this book is more closely matched by a number of histories of demography, although the latter usually focus on the rise of life expectancy without paying much attention to the decline of specific diseases. Accessible to a wide readership is James Riley's *Rising Life Expectancy: a Global History* (2001). This provides a short introduction to the rise of life expectancy since the 1700s, with extensive quantitative illustrations, including a comparison between countries and a synthesis of what we know about its explanation. Similar in scope, but limited to Europe, is Massimo Livi Bacci's *The Population of Europe: a History* (1999). Another source of inspiration for this book was Jean-Claude Chesnais's *The Demographic Transition* (1992), which has an in-depth analysis of differences between European countries in mortality decline. Needless to say, in view of the publication dates of these books they do not cover the most recent, and sometimes quite dramatic, trends in population health in Europe.¹⁶

Concepts, Sources, Data and Methods

This book is an attempt to describe and understand the 'big picture' of population health change, pulling together insights from many disciplines. As will be clear from the (rather long) list of references at the end, it relies on the work of many specialists. Historical demographers have laid the basis for the study of long-term trends in life expectancy. Economic historians have provided many new insights into the determinants of modern economic growth and its impact on human welfare, including population health. Medical historians have told the often detailed histories of medical discovery and medical invention that laid the basis for many improvements in population health. Finally, epidemiologists have often given us a better understanding of the determinants of

15 Kenneth F. Kiple, ed., *Cambridge World History of Human Disease* (Cambridge etc.: Cambridge University Press, 1993); Erwin H. Ackerknecht, *History and Geography of the Most Important Diseases* (New York & London: Hafner, 1965); Folke Henschen, *The History and Geography of Diseases*, trans. Joan Tate (London: Longmans, Green & Co., 1966); Mark Harrison, *Disease and the Modern World* (Cambridge: Polity, 2004). For a recently published history of 10 epidemic diseases and their impact on Western societies, see Frank M. Snowden, *Epidemics and Society: From the Black Death to the Present* (New Haven: Yale University Press, 2019).

16 James C. Riley, *Rising Life Expectancy: A Global History* (Cambridge etc.: Cambridge University Press, 2001); Massimo Livi Bacci, *The Population of Europe: A History* (Oxford: Blackwell, 1999); Chesnais, *Transition Démographique*.

the rise and fall of specific diseases. All this needed to be blended together in a single story-line, which implies that I often had to prioritize consistency over originality. To the extent that there is originality in this book, it is in the synthesis of these massive amounts of information, and in the comparisons across time and space that this allows.

This book is unashamedly 'Eurocentric'. Although there is a legitimate tendency in many historic sub-disciplines to replace a focus on European history with a more global perspective, the challenge of writing a global history of population health simply seemed too overwhelming. Even for Europe – where countries like Sweden and Britain were the first to start collecting statistical data on population health – it is often impossible to construct reasonably complete time-series covering the whole trajectory of health improvement since its very beginnings. On the other hand, there are great benefits in focussing on Europe: this allows us to exploit its fascinating variations in economic, political and sociocultural conditions over the past three centuries, and to discover how these have influenced population health.¹⁷

Whenever convenient, European countries will be grouped into a number of geographically contiguous and historically related regions. 'Northern Europe' will refer to Finland, Sweden, Norway, Denmark, and Iceland. 'Western Europe' includes England & Wales, Scotland, Northern Ireland, Ireland, the Netherlands, Belgium, Luxembourg, Germany, Austria, and Switzerland. 'Southern Europe' is France, Spain, Portugal, Italy, Malta, Greece, and Cyprus. 'Central-eastern Europe' is Czech Republic, Slovakia, Hungary, and Poland. 'South-eastern Europe' is Albania, Slovenia, Croatia, Bosnia & Herzegovina, Serbia, Montenegro, North Macedonia, Romania, and Bulgaria, and sometimes also includes Turkey. 'Eastern Europe' is Estonia, Latvia, Lithuania, Belarus, Ukraine, Moldova, and Russia. When the term 'North-western Europe' is used, it refers to Northern and Western Europe taken together.

It is important to be aware from the outset, however, that over the period covered by this book the political map of Europe has changed repeatedly (Plate 2). Many of these currently existing countries have only recently emerged as independent states. Many came into existence after the collapse of the Soviet Union and Yugoslavia in the 1990s, or after the dissolution of the Habsburg and Ottoman Empires immediately after World War I. Others emerged in the 19th century, after the coagulation of many smaller units into the unified German

¹⁷ In this book, Europe is the European subcontinent as usually understood. It (of course) includes Russia, but not the former Soviet republics of the Caucasus and Central Asia. Because South-eastern Europe has long been part of the Ottoman empire, the experience of Turkey will sometimes also be included in the analysis.

PLATE 2 Europe in the 18th century

This map shows Europe's political divisions at the start of the period covered by this book. Ireland was still part of the United Kingdom, and Finland of the Kingdom of Sweden; France was considerably smaller than it is now, after its expansion in the 18th and 19th centuries; Germany and Italy were still a patchwork of smaller political entities; Poland and Lithuania still clung together in a Commonwealth; and South-eastern Europe was still part of the Ottoman Empire. Collection Koninklijke Bibliotheek, The Hague. Reproduced with permission

KARL VON SPRUNER, *HISTORISCH-GEOGRAPHISCHER HAND-ATLAS ZUR GESCHICHTE DER STAATEN EUROPAS VOM ANFANG DES MITTELALTERS BIS AUF DIE NEUESTE ZEIT (ZWEITE AUFLAGE)*. GOTHA: JUSTUS PERTHES, 1854.

and Italian states. This implies that it is often difficult to trace the historical development of a current population's health, but these changes also have advantages for the study of population health. Shared destinies have emerged over time, whereas others have dissolved, with sometimes profound consequences for population health.

Finding a good starting-point for this book has not been straightforward. After considering several possibilities, I settled for the early 18th century. This

allows us to cover the entire trajectory of improving population health in Europe (although some improvements may already have occurred previously), and to use complete time-series of statistical data (although exceptionally some data go back even further). Several important time-series start somewhere in the first half of the 18th century, and although they cover a limited number of countries they are often very illuminating, and help us to interpret the trends seen in the increasingly complete time-series starting in the 19th and 20th centuries.

As mentioned above, the term ‘population health’ is to be understood as – literally – ‘the people’s health’, and needs to be distinguished from ‘public health’, which has been defined as ‘the art and science of preventing disease, prolonging life and promoting health through the organized efforts of society’. Public health includes activities such as food inspection, vaccination programs, tobacco control policies, and road traffic safety measures, to mention just a few. Public health is one of the two main things societies do to protect and enhance ‘the people’s health’, the other one being the delivery of medical care. The term ‘population health’ thus refers to the actual state of health of the people, which is determined by public health and medical care – and by many other factors.

Population health will be measured by a range of indicators, including measures of life expectancy at birth and years lived in good health, and measures of the frequency with which specific diseases occur and give rise to morbidity and mortality. Unfortunately, historical coverage of dimensions of population health is more complete for mortality than for aspects of health among those who are alive. In some European countries, routinely collected data on mortality go back as far as the 18th century, in many others to the 19th century. Relatively abundant data are available for long-term trends in life expectancy, crude mortality rates, infant mortality rates, and (largely limited to the 20th century) causes of death.

The sources of data on population health are listed in Suppl. Table 1. Particularly useful compilations that have been used in many illustrations are the Human Mortality Database, the Human Lifetable Database, Mitchell’s International Historical Statistics 1750–2010 (Volume 3: Europe, published 2013), Alderson’s International Mortality Statistics (published 1981), the WHO International Mortality Database, and the WHO Health for All Databases. Alderson’s mortality data were used for cause-specific mortality trends up to 1960, and WHO data for cause-specific mortality trends from 1960 and onwards. Please note that Alderson presented his data by five-year period, which smooths out annual fluctuations. Also very useful were the data compiled for the OECD ‘How was life’ project (e.g., on long-term trends in height and literacy). In

principle, trends will be shown on a gender-specific basis. This often implies choosing between men and women, but where trends differed this will be mentioned explicitly.

All these data have limitations in terms of comparability between countries and over time, despite the fact that variations and changes in registration have often been repaired in the international compilations just mentioned. Changes in understanding and classification of disease – not to mention the possibility of real changes in the manifestation of disease – represented an obvious issue to be addressed. Wherever disease-specific data from the 18th or 19th century have been used, such as in the few pre-20th century series of mortality by cause of death, I therefore had to follow the (published) insights of specialists in the field who have assessed the comparability of modern disease concepts with older diagnostic terms.¹⁸

It is only with the advent of the International Classification of Diseases (ICD) in the early 20th century that a basis was laid for better comparability of disease-specific mortality data, both across countries and over time. Among other things, the ICD provided a standard form for certifying the cause of death, and a set of harmonized rules for selecting and coding the ‘underlying cause of death’ from the conditions mentioned on this death certificate. While this system has dramatically improved the usefulness of cause-of-death statistics, it comes at the price of ignoring co-morbidity. If two or more diseases are involved in causing the death of a person, selecting one ‘underlying cause’ is often somewhat arbitrary. This was already problematic in the past, when people weakened by one infectious disease would more easily succumb to the following one, and has to be kept in mind even more today, when many elderly people die from the combined effect of several diseases.

For the analyses in this book, time-trends have been reconstructed by carefully selecting the code numbers from each edition of this classification, which changed approximately every 10 years to reflect new insights in nosology (see

18 A theoretical discussion of what ‘disease’ is, is beyond the scope of this book, but for an introduction see Chapter 3, and for a historical overview, see, e.g., Karl E. Rothschuh, “Der Krankheitsbegriff (Was Ist Krankheit) ,” in *Was Ist Krankheit?*, ed. Karl E. Rothschuh (Darmstadt: Wissenschaftliche Buchgesellschaft, 1975). It is likely that, over the three centuries covered by this book, many diseases have changed their manifestation, either spontaneously or under the influence of treatment; see Kurt Kohn, Hans H. Jansen, and Karl Freudenberg, *Gestaltwandel Klassischer Krankheitsbilder*, ed. Wilhelm Doerr (Berlin etc.: Springer-Verlag, 1957). Recent advances in ‘palaeomicrobiology’ may help to better interpret historical evidence: DNA testing of human remains buried during epidemics has sometimes confirmed the presence of the putative micro-organisms; see, e.g., Michel Drancourt, “Finally, Plague Is Plague,” *Clinical Microbiology and Infection* 18, no. 2 (2012): 105–06.

Suppl. Table 2). In a few cases, it has been necessary to adjust cause-specific mortality trends for changes in coding, by using differences in adjacent or overlapping years to bring the rates in previous periods up or down to the level in the more recent period. Despite these careful reconstructions, there is no guarantee that the changes over time and the differences between countries that we see in the data are all real. In addition to changes in understanding and classification of disease, we must also reckon with the greater likelihood of detection of disease in modern times.

As a result of people's more frequent contacts with the health care system, and of diagnostic methods' greater accuracy, less disease goes undetected now than in the past. This should warn us against taking the 20th century rise of diseases like ischaemic heart disease and cancer at face value. In such cases, it will be important to check for supporting evidence, for example an increase in people's exposure to established risk factors of the disease in question. More generally, an important remedy against all these uncertainties is to focus on 'the big picture'; many of the trends and patterns that we see in the following chapters are simply too big and too consistent to be due to artefacts in data collection.¹⁹

Which diseases to include was another important choice to be made. It was clear from the outset, that this book could cover only a small fraction of the total number of diseases that affected Europeans over these three centuries. Leaving out rare diseases, that number must be at least several hundred. As one of the purposes was to compare long-term trends between countries, which can only be done with mortality data, many of the diseases selected for review have been, or still are, important causes of death. To these have been added a few less fatal diseases, for which some quantitative data are available in the literature, such as pellagra and rickets. Together, the 40-or-so diseases covered provide a broad picture of the factors driving the development of population health in Europe.²⁰

19 Efforts to systematically 'repair' periodical changes in cause-of-death classifications are progressing slowly (e.g., France Meslé and Jacques Vallin, "Reconstructing Long-Term Series of Causes of Death: The Case of France," *Historical Methods* 29, no. 2 (1996): 72–87). The Human Cause-of-Death Database currently contains harmonized data from around 15 European countries, mostly from Central & Eastern and Eastern Europe (www.causesofdeath.org). Because these data cannot be compared with unadjusted data from routine data sources, and often cover only a limited period of time, they could not be used for this book. However, wherever relevant, results have been checked against trends as seen in the Human Cause-of-Death Database.

20 The *International Classification of Diseases* (10th revision, Clinical Modification) includes around 69,000 codes for diagnostic entities. The Global Burden of Disease study distinguishes 354 different diseases (GBD 2017 Collaborators, "Global, Regional, and National

Nevertheless, a few limitations need to be mentioned. First, the over-representation of potentially fatal diseases should be kept in mind when interpreting this book's main findings. For example, improvements in medical treatment reducing the case fatality of diseases have become more salient than would otherwise have been the case. Second, some determinants of population health cannot satisfactorily be captured when using a disease-specific lens. Diarrheal diseases give us a view of the history of unsanitary living conditions, and lung cancer and diabetes inform us about secular trends in smoking and obesity. But the health effects of environmental pollution, which are spread out over a wide range of diseases which also have many other determinants, risk to remain in the background when specific diseases are the main entry-point to the history of population health. I have partly remedied this by highlighting the health effects of air pollution in a section devoted to the lung diseases caused by occupational and environmental exposures.

I have tried to represent the European experience by including all available data in each graph, but with most countries represented by small-dotted lines in light grey. Visually, this produces a narrower or broader band showing developments in Europe as a whole. Within this band, some countries have been highlighted to illustrate the main patterns of variation. Usually Sweden (or one of the other Northern European countries) has been highlighted as a benchmark for best performance, and one country from each of the other larger regions has been marked as well, using the same colour in all graphs to ease recognition. Northern European countries are in dark blue, Western European in light green, Southern European countries in yellow, Central-eastern European countries in purple, South-eastern European countries in brown, Eastern European countries in red.

Wherever possible, mortality and morbidity rates have been age-standardized to take away the effect of variations in age-distribution between countries or over time. In order to facilitate comparisons between different graphs, most mortality rates have been expressed as deaths per 100,000 person-years, even if this is unusual (as in the case of the crude mortality rate, which is usually expressed as deaths per 1000). In the graphs, I have tried to avoid the use of logarithmic vertical axes, so that absolute magnitudes of change and variation can be compared more easily between diseases, countries and time-periods.

Incidence, Prevalence, and Years Lived with Disability for 354 Diseases and Injuries," *Lancet* 392, no. 10159 (2018): 1789–858). The *Cambridge World History of Human Disease* reviews 158 diseases, with a bias towards infectious diseases, and without entries for many other important health conditions (Kiple, *World History*).

The long-term trends shown in these graphs, which form the core of this book, will be combined with a digest of the – as mentioned above: massive – literature to understand how and why population health in Europe has changed as it has. I will present (almost) no statistical analyses of my own, in which putative determinants are related to health outcomes, but I will instead rely on what others have found. In contrast to the data presented in this book, which are almost exclusively national in character, some of the more recent studies of the determinants of mortality decline have used micro- instead of macro-level data, which is very useful because micro-level data are more suitable for addressing causal questions.²¹

As a complement to the graphs with secular changes in population health I have added a small number of illustrative pictures – historical maps, paintings, photographs, pages from influential books, etc. These are intended to remind the reader of the reality underlying the quantitative data, and somewhat abstract analyses, that form the core of this book. Finally, I hope that the very long reference list does not only serve its purpose of documenting the scientific basis for the statements made, but will also give readers who want to know more a good entry-point to the literature.

Readers who would like to have a closer look at the quantitative data used in the trend graphs, e.g. in order to check out the experience of non-highlighted countries, can find these online.²²

21 On the relative merits of macro- and micro-level analyses, see, e.g., S. Ryan Johansson, “Macro and Micro Perspectives on Mortality History,” *Historical Methods* 33, no. 2 (2000): 59–72. In the last two decades, micro-level analyses have become more prominent in historical demography, particularly for studying the determinants of secular changes in infant mortality; for a digest, see Lucia Pozzi and Diego Ramiro Fariñas, “Infant and Child Mortality in the Past,” *Annales de Démographie Historique*, no. 1 (2015): 55–75. See also Chapter 5.

22 An excel file with the data underlying the graphs can be found at dx.doi.org/10.6084/m9.figshare.11774652.